9 Strontium-90 ($^{90}_{38}Sr$) is a radioactive isotope that contains 38 protons and 52 neutrons. Strontium-90 decays to form an isotope of yttrium (Y) by emitting beta (β) particles.

(a) (i) Suggest how the nucleus of a stable isotope of strontium differs from a nucleus of strontium-90. Explain your answer.

suggestion .....

explanation .....

.....

[2]

(ii) Complete the nuclide equation for the decay of strontium-90 to yttrium.

$$^{90}_{38}Sr \longrightarrow \overset{.....}{\underset{.....}{\quad}}Y + \overset{.....}{\underset{.....}{\quad}}\beta$$

[2]

(iii) Explain why scientists limit the amount of time they are exposed to radioactive strontium.

.....

..... [2]

(b) Yttrium is also unstable. A scientist places a sample of yttrium near a radiation detector. Table 9.1 shows the count rate recorded by the detector as the sample decays.

Table 9.1

time / h	recorded count rate / counts / min
0	68
50	49
100	38
150	32
200	26
250	24
300	20
350	21
400	20

Fig. 9.1 shows a graph of the count rate **due to yttrium** against time.

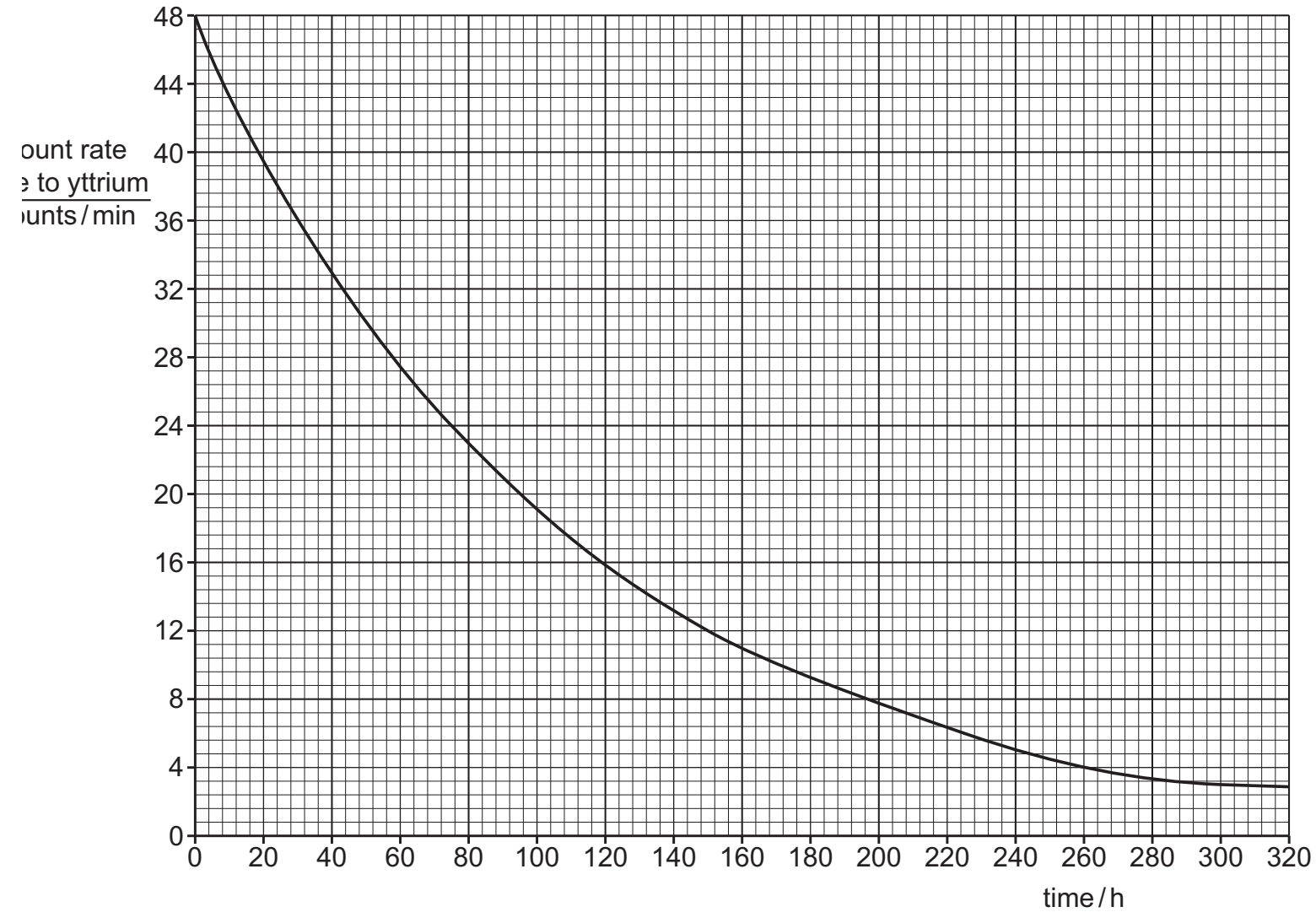

Fig. 9.1

(i) Use Fig. 9.1 to determine the half-life of yttrium. Show your working.

half-life = ... h [3]

(ii) Explain the difference between the count rate in Table 9.1 and the count rate due to yttrium plotted on the graph in Fig. 9.1.

.....

.....

..... [1]

[Total: 10]